

than in *dispar* and *mæstus* all the tibiæ are annulated near the middle, while in *virginicus* the annulations are nearer the base of each tibia and more irregular in form, some of the paler hairs extending to the basal part of the tibia on its inner side.

From *mixtus* and *mæstus*, *P. virginicus* differs so greatly in the form of antennæ that there is no risk of confusion. The antennæ of *P. dispar* ♂ are one half longer than body (not one half the length of the body as erroneously stated in "Rhynchophora of N. E. America") and it is possible that the male of *virginicus* has also antennæ longer than the body.

NOTES ON THE OVIPOSITION OF SOME SEMI-AQUATIC HEMIPTERA (HEBRUS, SALDA, LAMPROCANTHIA).

BY H. B. HUNGERFORD,

LAWRENCE, KANSAS.

In 1911 the late Doctor Heidemann published "Some Remarks on the Eggs of North American Species of Hemiptera Heteroptera,"¹ in which he listed the eggs of the Hebridae, Saldidae and Mesoveliidae as unknown. Since that time Reuter in his "Neue Beiträge zur Phylogenie und Systematik der Meriden, nebst einleitenden Bemerkungen über die Phylogenie der heteropteren Familien, 1910" attempted to show the phylogenetic relationships of the families of heteroptera. In 1912 he modified his system in the light of added evidence. It is in his "Bemerkungen über mein neues Heteropteran System, 1912" that he quotes Bergroth to the effect that Bueno had examined the egg of Mesovelia and established its great similarity to the Nalidae. Since that time the writer has figured and described the egg of *Mesovelia mulsanti*, White.

In reviewing Kirkaldy's splendid papers on British water bugs, 1894-1908, Wesenberg-Lund's "Fortpflanzungsverhältnisse: Paarung und Eiablage der Süßwasserinsekten," as well as such texts as Bade, '09, Brauer, '09, Ulmer, '11, and Brocher, '13, it would appear that the egg stages of Hebrids and Saldids are as yet unnoted.

¹ Proceedings Ent. Soc. Wash., XIII, No. 3, p. 128.

In connection with his work in the limnological laboratory at Cornell University it was the writer's good fortune to observe the oviposition of several of the aquatic and semi-aquatic bugs. It is concerning the latter that he wishes to report herewith.

To one accustomed to collecting in the sluggish streams and artificial ponds in Kansas the environs of Ithaca, N. Y., afforded a rare opportunity. Here within easy reach of Cornell University are to be found all gradations from sparkling brooks, broken by waterfalls and rapids, to dark-colored sluggish streams of the upland bogs, from spring-fed pool to lake conditions.

It was on the border of a spring-fed pool in an upland meadow near Ringwood Hollow that Hebrids and two species of Saldids were found in numbers. The Hebrids were numerous in the moss and dead grass by the water's edge while the Saldids were about the grass and sedge clumps and upon the moist earth of the exposed areas.

HEBRUS.

On June 4 Mr. C. H. Kennedy brought to the writer an adult Hebrus from Ringwood Hollow. Subsequently they were found about several water bodies in the neighborhood of Ithaca. By June 22 at Ringwood these little bugs were mating in numbers and many were brought into the laboratory.

On June 28 the pool was visited again and a goodly number taken on the moist earth at the water's edge. By disturbing the moss it was found that they would take to the open areas, even venturing upon the water for a short run. They are not as safe upon such footing as are the little *Microvelia* which they superficially resemble, although when one became submerged accidentally it walked upside down under the surface film as upon a ceiling, stopping now and then to clean the antennæ and limbs as it frequently does when in its normal environment. The body was surrounded by a layer of air which held it up to the surface film. It finally came upon a bit of moss projecting from the water and escaped.

The live bugs taken June 22 and June 28 were placed in large petries prepared for them by placing some moist sand in the bottom and adding a few bits of moss.

On June 26 the moss in the petrie containing those captured June 22 was examined superficially under the binocular and no eggs dis-

covered. A more careful examination with dissecting needles revealed some of the yellowish-white eggs already showing the red eye spots, hidden between the closely approximated leaves. Some of them seemed to lie on the upper concave side beneath the pale green sheath of the moss leaf, as shown in the figure (Pl. I, fig. 2). For the most part they were concealed as shown in fig. 8, between the leaf and the stem.

In an endeavor to determine whether the female would ever place the eggs in the tissues of plant stems, some females were confined in a small stender dish with a leaf of moneywort, a soft stem of a dead sedge, and a variety of moss having the leaf axils far apart, thus providing no hiding place for the eggs. Eggs were laid in the mat or tangle of rootlets at the base of the moss and, in some instances, the tip of one leaf was glued to the one above it and here two or three eggs would be found as shown in the sketch (Pl. I, fig. 4).

DESCRIPTION OF THE EGG.

Size.—.625 mm. by .325 mm. This represents the size shortly before hatching. Somewhat more slender when deposited. The eggs are large for the size of the bug. One female measuring .925 mm. across the prothorax contained four well-developed ova each measuring .625 mm. by .25 mm. The figures of the female abdomen and the egg are drawn to the same scale (Pl. I, figs. 3 and 2).

Shape.—Elongate oval, ends rounded, length about two times the width.

Color.—Pearly white changing to yellowish white as embryo develops within. Some appear to be surrounded by transparent gelatine. Under the low power compound the surface of the egg is seen to be covered by short irregularly arranged elevations. In the case of those containing well-developed embryos the eyes show as pink spots and a pair of black dots lie on the ventral side near the apex of the head.

NEWLY HATCHED NYMPH.

The nymph upon issuing from the egg casts a thin transparent membrane which surrounds each appendage separately and is of the nature of a true moult. This the writer proposes to designate the *postnatal moult*. It is possessed by many heteroptera and some other insects observed by the writer.

HABITS OF ADULT.

The Hebrids were fed, in captivity, upon newly killed midges, mosquitoes, and plant lice. They are cleanly little creatures grooming themselves much after the fashion of *Microvelia* as reported by Bueno. They were observed to be positively phototropic to electric light. When a light was brought to one side of the petrie containing many individuals they would promptly move to side of greatest illumination.

SALDIDS.

The two species of Saldids observed were *Salda anthracina* Uhl. and *Lampracanthia crassicornia* Uhl. Both of these are shiny black, slightly hirsute species with tegmina coriaceous. The former is plump bodied and of fair size, the latter a smaller, more slender form, covered sparsely with stiff hairs.

They have the same habitat and attempt to escape by running and by quick short jumps rather than by flight. Their food, mating, and oviposition habits are much the same. When first observed about the Ringwood pool on June 22 only adults were found of the *L. crassicornia* while the *S. anthracina* were all in the nymphal stage. June 28 many of the latter were in the last nymphal stage. Eleven of these were brought in alive, placed in a large stender dish and fed flies, Jassids, etc. July 1 one became adult and by July 5 there were four adults, the remainder following shortly. Mating took place and eggs were found between the leaves of the moss on July 16.

It was noted above that the smaller species was in the adult stage when first taken. These were at once placed under observation in jelly glasses containing a quarter inch of moist sand. One pair was placed in each glass in order to get a record of mating and egg-laying. Most of the observations relate to this species, although they apply almost equally well to the larger form.

HABITS OF THE ADULTS.

They are shy, cautious creatures which hide among the clumps of shore grass and moss patches. They feed upon such insects as they may chance to meet, even the disabled of their own kind.

MATING.

The male follows the female about for some moments, often minutes, before mounting her with a sudden pounce. He appears to keep at a respectful distance and if his first clasp is not secure he gets away quickly. And well he may, for in some of the glasses the males were killed and in one case the female was observed still feeding upon her unlucky mate. The males are smaller and more slender than the females and take a position on the left side of the female (as a rule) and a little below, appearing to perch upon the middle femur of the female's left leg. The middle and right hind legs of the male lie along the left margin of the female. With the antennæ directed backward he remains rigidly in place while the female moves about with antennæ directed forward. It was not possible to ascertain how the male could retain his position so firmly in place. All efforts to be certain that his legs were involved in clasping failed. Mating took place at short intervals and often lasted for half-hour periods. One pair was observed to mate repeatedly every day from June 28 to July 16 when the male was found dead. Eleven eggs had been laid during this time.

OVIPOSITION.

The eggs were hidden away, one in a place as a rule, between the leaves of moss or beneath the sheaths of the shore grasses. When in the moss they are exceedingly inconspicuous and when at the base of grass clumps remain concealed until disturbed. Two illustrations are submitted herewith to indicate the manner in which they are to be found. (See Pl. I, figs. 6 and 10.)

EGG OF *S. ANTHRACINA*.

Size.—Length 1.05 mm., diameter .375 mm.

Shape.—Elongate cylindrical, one end broadly rounded, the other constricted near the end and curved upward in such a manner that in profile one side appears slightly concave and the other considerably convex.

Color.—Pearly white and shiny. Smaller end slightly whiter. Surface finely granular as seen under low-power compound.

NYMPH OF *S. ANTHRACINA*.

When this species was first taken all the specimens were in the last and next to last instar. The nymphs are somewhat more flattened than the adults. The antennal segments are thicker in proportion to their length and the eyes much less protuberant. Ocelli are lacking in the nymph while the adult possesses a pair of prominent ones. The tarsi are two-segmented in the nymph, three in the adult. Secondary sexual characters not apparent in the nymph.

EGG OF *LAMPACANTHIA CRASSICORNIS* UHL.

Size.—Length 1 mm., diameter .3 mm.

Shape.—Elongate cylindrical. Both ends bluntly pointed, one more than the other and curved upward. Camera-lucida drawings of the eggs of both species are shown drawn to the same scale on Pl. —, figs. 7 and 11.

SUMMARY.

Hebrus concinnus, *Salda anthracina*, and *Lampracanthia crassicornis* were found about the moss and clumps of shore grasses bordering a swampy pasture pool in New York. All three bugs hide their eggs between the leaves of the moss. The Saldids often place their eggs at the bases of the grasses growing on the moist banks of the pool. *L. crassicornis* appeared as adults some ten days before *S. anthracina*.

The Hebrids are but little disturbed by close confinement and the Saldids can be kept in the laboratory if provided proper quarters.

These few notes are submitted at this time in view of the need for even meager information concerning the shore bugs herein discussed.

EXPLANATION OF PLATE I.

Fig. 1. *Hebrus*, ventral view of male abdomen.

Fig. 2. *Hebrus*, egg partially dissected from a bit of moss. Egg shows the red eye spots of embryo within.

Fig. 3. *Hebrus*, ventral view of abdomen of female. (Drawings 1, 2 and 3 made to same scale. Note the relatively large size of the egg.)

Fig. 4. *Hebrus*. Eggs in loose-leaved moss showing attempt to conceal by fastening the tip of one leaf to the one above it with some gelatinous material.

Fig. 5. *Hebrus*. Egg freshly laid, surrounded by the hyaline tissue of a moss leaf.

Fig. 6. *Lamprocanthia crassicornis*, egg in situ between the leaves of moss.

Fig. 7. *Salda anthracina* egg. Camera lucida drawing. (Same scale as Figs. 6 and 11.)

Fig. 8. *Hebrus*. Egg in situ between the leaf and stem of a close-growing moss.

Fig. 9. *Lamprocanthia crassicornis*, ventral view of abdomen of male.

Fig. 10. A clump of sedges showing the eggs of *C. crassicornis* in situ.

Fig. 11. *L. crassicornis* egg. Compare with Fig. 7.

Fig. 12. *L. crassicornis*, ventral view of abdomen of female.

THE EUROPEAN MOLE CRICKET, *GRYLLOTALPA* *GRYLLOTALPA* L., AN INTRODUCED INSECT PEST.

BY HARRY B. WEISS AND EDGAR L. DICKERSON,¹

NEW BRUNSWICK, N. J.

The occurrence of the European Mole Cricket in this country has already been recorded (Jour. Econ. Ent., Vol. VIII, p. 500) but as the insect still maintains its existence in the place where it was first observed and as it may be introduced into other localities, it seems worth while to give a brief account of its habits and development. As previously noted the insect was first observed in this country in a nursery at Rutherford, N. J., where a large number of plants are yearly imported from Europe. "This infestation, which is undoubtedly of several years' duration, extends over several acres planted to herbaceous and ornamental stock, a considerable portion of which is used for show purposes only. The soil is rather light and porous and contains a variety of shrubs, shade trees, etc., such as one would naturally find in a nursery. No preference is shown by the cricket for any particular plant, its zig-zag burrows being found in different parts of the area irrespective of the kinds of plants growing there. The insects have been numerous enough for the nursery to detail several men at certain periods to hunt them out and destroy as many as possible every few days."

¹The arrangement of the authors' names has no significance and indicates neither seniority nor precedence.